RELATIONSHIP OF METACOGNITION, CONSCIOUSNESS AND ATTENTION-REGULATION WITH PROBLEM SOLVING ABILITY OF HIGHER SECONDARY SCHOOL STUDENTS

A

SYNOPSIS

Submitted to

Dayalbagh Educational Institute

(Deemed University)

For the Partial Fulfillment

of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

[2015]

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1.0.0 INTRODUCTION

The research on Meta cognition emphasizes on various deep and basic issues regarding consciousness as well as its role in human behavior. Meta cognition study relates the procedure through which human being self-reflect on their own memory and cognitive process (monitoring) and how they set their Meta knowledge to apply in regulating their information processing and actions (control). Meta cognition relates the research of what people know regarding cognition in common, and regarding their own memory and cognitive processes, exactly, and how they set that information to apply in controlling their cognitive processing and behavior. The notion of Meta cognition is helpful to get knowledge about the inferences that are drawn in relation to the mental states of others and the consequences regarding one's own mental states.

Meta cognition is a basic feature of people's cognition. Organisms not only possess cognitive activities but they know its application to Meta cognition. In other words, one has cognitions about cognition. Meta cognition possibly appears typical in human species or it can be connected to our being linguistic animals. Meta cognition is essential for the reason that knowledge in reference to one's cognitive process can lead in arranging situations and opting strategies to get better future cognitive actions.

In several ways, general study on Meta cognition commence with the 'feeling of knowing' phenomenon (hart, 1965) in accordance to which individuals may anticipate the possibility that they will be able to memorize a particular section of presently non-recallable information.

The term Consciousness includes a variety of aspects that studies the connection between the mind and the world with which it interacts. Consciousness has been explained as attentiveness: subjectivity; alertness; the talent to feel experience; having a selfhood sense; or the executive control system of the mind. According to Wundt (1896) "Consciousness is not a particular mental process, cording with others; it consists entirely in the fact that we have internal experiences." Titchener (1923) defined consciousness as "The sum total of mental processes occurring now, at

any given present time". The given definitions relates to our equation of consciousness with the set of cognitive units that comes in process at a given point in time. William James (1902) observed regarding a special type of consciousness which is our waking, normal, consciousness. Therefore Consciousness can be:

1. Having an awareness of one's surroundings as well as one's own ideas, existence, and feelings.
2. Being competent of thought, desire, or perception: the growth of conscious being on the earth.

To understand consciousness three standard meanings have been developed:

Firstly, consciousness may be explained as the waking state. This fundamentally means that to be conscious, one has to be aware, attentive or cautious. The phases of consciousness can extend from restiveness, to sleep to coma even.

Secondly, consciousness is explained as experience based on subjective approach. This idea proposes that consciousness is the collection of experiences from one moment to another. Consciousness is extremely personal, related to a conscious subject with a certain point of view.

Thirdly, consciousness may possibly be explained as the mind. Any mental state with a propositional content is regarded as conscious. Hence this comprises values, expectations, goals, hopes and wishes.

Koch (2009) has given some explanations about consciousness which are as follows:

- Consciousness is the internal mental life that we lose every night when we fall into dreams sleep.
- Glasgow Coma scale that evaluates the responses of patients, which is developed for the measurement of Consciousness.
- In terms of philosophy, consciousness is like feeling something.

Attention is one of the various lenses through which every individual experience is filtered. As a magnifying glass, attention focuses on some information with the natural inferences of not including other information. All Human beings have power of many sense organs like power of

vision, direction, as well as touch to provide a constant, efficiently overpowering flow of information to the mind, and the attention controlling system works to recognize the main information within that flow through tactically changing or sustaining attention (Arnsten & Castellanos, 2011). As a result, in determining how one interprets and makes sense of experiences the system of attention regulation is much powerful.

A number of evidences have proved that good attention regulation is a key in healthy development that is fairly liberated from emotional and behavioral problems. Obstacles arise in good attention regulation when aggression and delinquency occurs in human behaviors at the same time. (Kochanska & Knaack, 2003; Murray & Kochanska, 2002; Olson, Sameroff, Kerr, Lopez, & Wellman, 2005; Zhou et al., 2007). Those students with good attention regulation have additional capability and flexibility in selecting information in the external world and in their inner thought processes. An effective strategy to modulate anger can be refocusing attention which reduces its contribution to antisocial behavior (Kim & Deater-Deckard, 2011; Morris, Silk, Steinberg, Terranova, & Kithakye, 2010; Rothbart, Ellis, Rueda, & Posner, 2003). Attention regulation plays an important role in controlling improper impulsive behavior. (Posne & Rothbart,2006).

Problem solving ability is the outline or pattern within which inventive thinking and logic take place. It is the ability to imagine and work on given levels of intricacy. People who have knowledge of efficient problem solving techniques are capable to solve problems at higher level of hurdle more than gifted people who do not have such training. The capability of problem solving involves an interaction among Meta cognition, Consciousness and Attention-Regulation. The trouble in problem solving ability is that the students are not aware of their cognitive process which they apply unknowingly in solving problems.

1.1.0 EMERGENCE AND JUSTIFICATION OF THE PROBLEM

This study investigates the relationship of Meta -cognition, Consciousness and Attention-Regulation with Problem solving ability among the higher secondary school students and studies the

contribution of these predictor variables on criterion variable. The relevance of this study is for developing problem solving skills, meta-cognitive skills and self confidence among the students. Consciousness plays an important role in acquiring problem solving skills. It is seen that many times students face many problems in the solving the tasks given because these tasks are not according their mental level. Sometimes tasks are very easy and sometimes very hard hence it is the unawareness in student's level of meta-cognition. Recently, it is observed that students are facing many problems related to concentration and attention in academic studies because they are unaware about the concept of consciousness and lack self consciousness about their work due to which their performance is not improved. Hence consciousness and problem solving skills are associated.

The purpose of this study is to examine the relationship of meta-cognition, consciousness and Attention-Regulation with problem solving ability of students. So the researcher of the present study has decided to take this problem for the purpose of research. The area of topic is considered to be novel in all aspects.

Kirsh (2005) argued that meta-cognitive equipment offers pupils various tactics that can frame most efficient information processors and permit them to evaluate and control the learning functions. He gave various useful Meta-cognitive modelling methods by which students can progress in management of time through extraneous means. Firstly, designers should add notifications, practice sets and other artefacts in order to improve students' tracking of their instance. Secondly, designers should add the extra helping equipments for the students to test all the quarries in advance.

Meta-cognitive practice such as self control obliges individual's talent to build up, thoughts, feelings, and gain good ability of solving problems (Treffinger,Selby,&Isaksen, 2008). The outcomes indicate that after getting Meta-cognitive instructions students show better ability of solving problems in educational tasks. It is also checked that associations of problem solving content with Meta-cognitive instructions is practically useful (Mevarech & Mramarski, 2003). Likewise, the students who have better ability to solve problems, performed with higher Meta-

cognitive ability (Pan, 1993). Kramarski and Mevarech (2003) gave the Meta-cognitive instruction method to get better and developed pupils. He emphasized on their ability to raise Meta-cognitive questions, the questions regarding the nature of a problem and use of previous knowledge to solve problem and association between the previous and new knowledge.

Consciousness is not limited to mental content but includes the performed operations on this content (norman & Shallice, 1986). Consciousness content is preferably attended to and uphold in working memory and it is removed if not needed. Next function is purposeful control of action. Action is regulated intentionally and can be overdue if appropriate conditions do not appear. Through this new hierarchies are established and the existing conflicts are resolved. Thus mental content is useful in grasping and demonstrations of creativity and arts. Normally contestant in mental pressure generates dullness and stiffness (Baumeister, Schmeichel, DeWall, &Vohs). Notable dimension of controlled consciousness is its capacity of restrictions. Therefore limited things can be manoeuvre at once (Pashler, 1998).

Attention and consciousness are closely related to each other that developed by the observation that conscious processing capability is relatively partial. For the instant, consciousness will be understood by the similar meaning of word awareness, and as we know that conscious processing is relatively limited it means we can be alert and aware of just limited things at any one moment. At once, thinking about two things seriously for example, a lecture and your daydreams -are really not possible. In psychology attention refers to select information for conscious thought, and since the degree of conscious capability is relatively restricted, attention at the same time inhibits other information from reaching to awareness. For consciousness attention may be seen as the gatekeeper. When information reaches to awareness before that it filtered by attention, and whatever attention passes, it becomes conscious.

Table 1 Researches related to the study

S.N.	Name of the Researcher	Year	Research Problem	Research Findings
1	Aurah, Dr. Catherine M. et. al	2014	*"Predicting Problem Solving Ability From Meta cognition And Self-Efficacy Beliefs On a Cross Validated Sample"*	The results revealed that Meta cognition and self efficacy are important component in predicting genetics problem solving ability. Moreover the relationship involving Meta cognition and capability of genetics problem solving in moderated by self efficacy. This study found way to instructional methods for biology teachings.
2	Winkielman, Piotr et. al	2007	*"Unconscious, Conscious, and Meta conscious in Social Cognition"*	This study concluded with the idea that science still facts to grasp the concept of consciousness completely.
3	Ozsoy, Gökhan et. al	2009	*"The effect of meta cognitive strategy training on mathematical problem solving achievement"*	Findings suggested that pupil's Meta cognitive dealing group considerably improved in both attainment of arithmetical problem solving and Meta cognitive skillfulness.
4	Hargrove, Ryan A et. al	2010	*"The Impact of Meta cognitive Instruction on Creative Problem Solving"*	Results indicate that the treatment group scored higher than their matched peers on two different measures of creativity. In addition, the performance of the students in the treatment condition was significantly better on a summative design thought model project.
5	Shen, Chun-Yi et. al	2011	*"Meta Cognitive Skills Development : A Web-Based Approach In Higher Education"*	The results explained that post-test scores were radically superior to the pre-test scores in self-monitor, self-plan, and total score of experimental group, while there was no importance of these in the control group. In totalling, in comparison to control group, scholar in experimental group recorded extensively better expand in self-plan.
6	Anandaraj, S. et. al	2014	*"A Study on the Relationship Between Meta cognition and Problem Solving Ability of Physics Major Students"*	The problem was studied with the help of survey method to collect data and random sampling to select 636 physics major students. In the results, the level of Meta cognition and problem solving ability was found moderate in physics major students.

7	Lai, Emily R. et. al	2011	*"Meta cognition: A Literature Review Research Report"*	This report represents that Meta cognition as "thinking about thinking." According to this report the factors which help to improve the Meta cognition are practical facts, proper tutoring and favoring the idea that pupil can be educated by the replication on their self thinking.
8	Panaoura, Areti et. al	2009	*"Young Pupils´ Meta cognitive Ability In Mathematics"*	This study represents the initial phase of developing instrument for young children for the measurement of Meta cognition in mathematics learning. Results found that of pupils´ displayed or showed very poor knowledge about their cognitive abilities in their attempt to solve a non-routine problem.
9	V Harandi, et. al	2013	*"The Effect of Meta cognitive Strategy Training on Social Skills and Problem-Solving Performance"*	This study aims at assessing the consequence of training of Meta cognitive tactic on Problem-solving Performance and social skills among high school girls. The findings showed that improvement in both social skills and problem-solving performance extensively.
10	Calanan, Dana M	2012	*"Altered States of Consciousness & The Creative Individual: Breaking the Affective Thinking Skills Paradigm"*	This project emphasizes on the association of the two sides of creative thinking i.e. affective side and cognitive side. Findings of this project removes gap between affective side and cognitive side of creative thinking. It builds a bridge between both of the sides of creative thinking.
11	Thornley,N. et al	2012	*"The elephant and the rider: The prefrontal cortex, attention-regulation and eudaemonic well being"*	The study presented links between attention regulation and positive conclusions in different life fields. In anticipation of this point , no instrument has been explained that could clarify why attention Regulation might enhance to such positive results.
12	Kazemi, Farhad et.al	2011	*"Investigation the impact of chess play on developing meta-cognitive ability and math problem-solving power of students at different levels of education"*	This study focus on development of mathematical problem-solving ability and meta-cognitive ability by the effect of chess play learning of different stage pupils of school. Findings showed that students indicate the higher level of achievement in mathematical problem solving abilities and meta-cognitive abilities those plays chess rather than non-chess player students.

1.2.0 STATEMENT OF THE PROBLEM

In reference to the above justification the present problem can be stated as below:

"RELATIONSHIP OF METACOGNITION, CONSCIOUSNESS AND ATTENTION-REGULATION WITH PROBLEM SOLVING ABILITY OF HIGHER SECONDARY SCHOOL STUDENTS."

1.3.0 OPERATIONAL DEFINITIONS OF THE TERMS USED IN THE PROBLEM

1.3.1 METACOGNITION

According to Flavell (1979), "Meta cognition consists of both meta cognitive Knowledge and meta cognitive experience and regulation. Meta cognitive Knowledge refers to acquired Knowledge about cognitive processes, knowledge that can be used to control cognitive processes. Flavell further divides meta cognitive knowledge into three categories: knowledge of person variables, task variables and strategy variables".

1.3.2 CONSCIOUSNESS

According to Davis, (1987) "Consciousness is a stream or an ever-changing flow of awareness. Consciousness includes mixture of sensations from the external world, sensation from your body, memories of the past, images and day dreams and expectation about the future."

1.3.3 ATTENTION-REGULATION

"The attention regulation serves to identify the most important information within that stream by strategically shifting or sustaining attention (Arnsten & Castellanos, 2011)."

1.3.4 PROBLEM SOLVING ABILITY

According to L.N. Duby; "Problem solving ability is a procedure of overcoming difficulties that show to interfere with the achievement of aim."

1.4.0 OBJECTIVES OF THE STUDY

The objectives of the present study can be laid down as follows:

- To study the relationship among Meta cognition, Consciousness and Attention- Regulation of higher secondary school students.

- To study the relationship between Meta cognition and Problem solving ability of higher secondary school students.
- To study the relationship between Consciousness and Problem solving ability of higher secondary school students.
- To study the relationship between Attention-Regulation and Problem solving ability of higher secondary school students.
- To study the contribution of the Meta cognition, Consciousness and Attention-Regulation on Problem solving Ability of higher secondary school students.

1.5.0 HYPOTHESES OF THE STUDY

The following hypotheses are formulated for the present research:

- There exists no significant relationship among Meta cognition, consciousness and Attention-Regulation of higher secondary school students.
- There exists no significant relationship between Meta cognition and problem solving ability of higher secondary school students.
- There exists no significant relationship between consciousness and problem solving ability of higher secondary school students.
- There exists no significant relationship between Attention-Regulation and problem solving ability of higher secondary school students.
- There will be significant contribution of Meta cognition than Consciousness and Attention-Regulation in the determination of Problem Solving Ability of higher secondary school students.

1.6.0 DELIMITATIONS OF THE STUDY

The present study will be delimited in reference to the following points:

1. The study will be delimited to the higher secondary schools of Agra city only.
2. The study will be confined to the sample of 1000 higher secondary school students.

3. The higher secondary schools of UP Board & CBSE Board will be included in the study.

1.7.0 VARIABLES OF THE STUDY

1. Independent Variable (Predictor Variables):

- Meta cognition,
- Consciousness and
- Attention- Regulation

2. Dependent Variable (Criterion Variables) :

- Problem solving ability

1.8.0 DESIGN OF THE STUDY

The design of the study can be stated under the following heads:

1.8.1 Method of the study

Researcher will employ Descriptive Survey Method.

1.8.2 Sample of the study

The sample in the present study comprises of 1000 students at higher secondary level of schools affiliated to U.P. Board, and CBSE Board. Both genders will be considered in the study. The researcher will select the schools by purposive sampling and selection of the students will be conduct by randomization.

1.8.2.1 Sampling Design

The study consists of males and females of higher secondary schools. The Sampling design of the study as described:

(I) **Sampling Unit and Sampling Size:** Students of class XI of the CBSE and UP Board schools will be selected by random sampling method. The Sample size consists of 1000 students of class XI of CBSE and UP Board schools.

(II) Sampling Method: Purposive sampling will be used in selection of schools and Random sampling method will be used in the selection of students.

Plan and procedure of the study is also given in the form of a diagram. For simplify the procedure of the study in the form of flow chart.

SAMPLING DESIGN

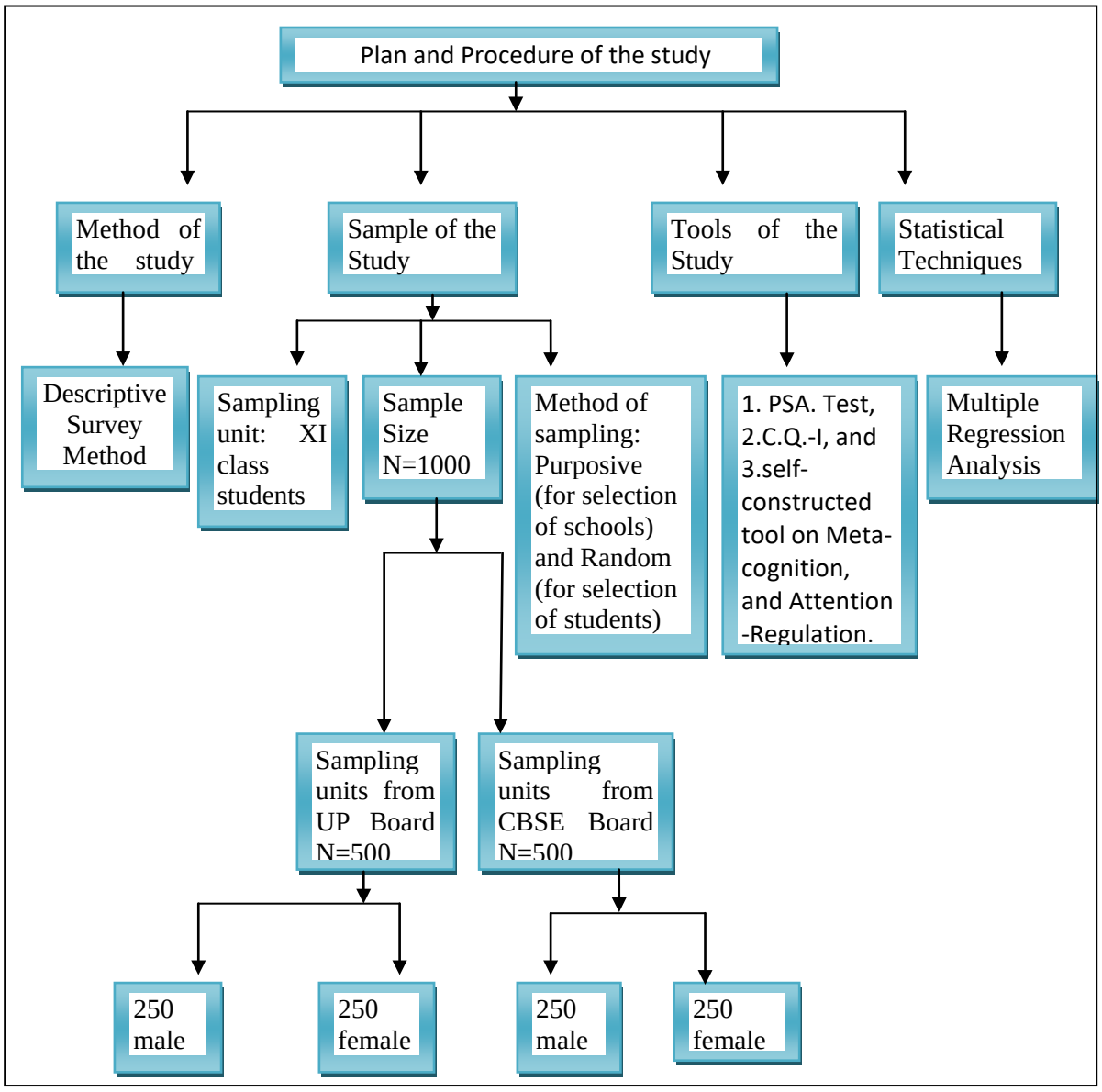
Plan and Procedure of the study
Method of the study
Sample of the Study
Tools of the Study
Statistical Techniques
Descriptive Survey Method
Sampling unit: XI class students
Sample Size N=1000
Method of sampling: Purposive (for selection of schools) and Random (for selection of students)
1. PSA. Test, 2.C.Q.-I, and 3.self-constructed tool on Meta-cognition, and Attention -Regulation.
Multiple Regression Analysis
Sampling units from UP Board N=500
Sampling units from CBSE Board N=500
250 male
250 female
250 male
250 female

Figure 1 Exhibiting the plan and procedure of the study.

1.9.0 TOOLS AND TECHNIQUES EMPLOYED IN THE STUDY

Researcher will be used three types of data collection instruments in this study. These are:

- Problem Solving Ability Test by. L. N. Dubey.
- CQ-i (Consciousness Quotient Inventory), by Ovidiu Brazdau (2013).
- Self constructed tool on Meta-Cognition
- Self constructed tool on Attention-Regulation

1.10.0 STATISTICAL TECHNIQUES

The statistical technique to be used by the researcher for analyzing and interpreting data will be as follows:

- Multiple Regression Analysis

1.11.0 SIGNIFICANCE OF THE STUDY

In the significance of the study we can say that meta-cognition, consciousness and Attention-Regulation play an important role in determining the problem solving ability of students. Consciousness is related to the self awareness and concentration and its effect on the students attention power. If students have good consciousness regarding their studies, their attention, concentration power and focus on their work then studies will be automatically good and they would be able to solve any problem at any condition.

In the same way meta-cognition is a cognitive power that can be improved by practice and by giving challenging tasks to the students and after the improvements of these mental capacities the problem solving ability of students will also develop. Meta-cognition also helps in identifying the student's mental capacities of problem solving ability by having the knowledge about the student's mental level. Teacher can provide the teaching learning material according to their mental level, so they can handle the tasks in accordance to their easiness.

Similarly Attention-Regulation is also a determining factor in problem solving ability of students. It develops student's concentration power and their study power.

Thus it can be said that Consciousness, Meta-cognition and Attention-Regulation play a significant role in the process of problem solving. All the variables have their independent educational implications and significance.

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